TRANSNUCLEAR
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March 23, 2007
E-24782

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Subject: Submittal of Biennial Report of 72.48 Evaluations Performed for the Standardized Advanced NUHOMS® System, CoC 1029, for the Period 3/21/05 to 3/20/07, Docket 72-1029

Gentlemen:

Pursuant to the requirements of 10 CFR 72.48(d)(2), Transnuclear, Inc. herewith submits the subject 72.48 summary report. This report provides a brief description of changes, tests, and experiments, including a summary of the 72.48 evaluation of each change implemented from 3/21/05 to 3/20/07. Certain of these evaluations had associated Updated Final Safety Analysis Report (UFSAR) changes that were incorporated into the UFSAR for the Standardized Advanced NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel, ANUH-01.0150, Revision 2, submitted in August 2006, while others have associated UFSAR changes that will be incorporated in the next update.

Should you or your staff require additional information, please do not hesitate to contact me at 410-910-6878 or Dr. Jayant Bondre at 410-910-6881.

Sincerely,

Donis Shaw

Donis Shaw
Licensing Manager

cc: Mr. Joseph Sebrosky (NRC SFST), provided in a separate mailing

Enclosures:

1. REPORT OF 72.48 EVALUATIONS PERFORMED FOR THE STANDARDIZED ADVANCED NUHOMS® SYSTEM FOR THE PERIOD 3/21/05 TO 3/20/07

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REPORT OF 72.48 EVALUATIONS PERFORMED FOR THE STANDARDIZED ADVANCED NUHOMS® SYSTEM FOR THE PERIOD 3/21/05 TO 3/20/07

DESIGN CHANGES

LR 721029-103, Rev. 1 – *(incorporated into UFSAR Revision 2)*

Change Description:

This 72.48 evaluation addresses an alternate configuration for the three top tie beams of the AHSM roof. It evaluates the use of five #9 rebars for each beam as opposed to the existing configuration of eight #8 rebars. UFSAR drawing NUH-03-4011 is revised to reflect this alternate AHSM roof tie-beam configuration. The calculated stress results for this alternate tie beam configuration are reported in UFSAR Table 3.6-21.

Evaluation of Change:

The tensile capacity of each tie beam with five #9 rebars is 270 kips. The tensile capacity of all three tie beams is 810 kips (270 kips x 3). The tensile force to be resisted by all three ties is 779 kips. Therefore, the maximum stress ratio is 0.96 (779/810).

Thus, the alternate design with five #9 rebars is adequate. The roof ties are not addressed in the AHSM thermal and shielding analysis. Hence, there is no impact on the safety function of the thermal and shielding performance of the AHSM.

LR 721029-166 – *(incorporated into UFSAR Revision 2)*

Change Description:

This 72.48 evaluation addresses revision of Specification ANUH-01-101 to define the basis for temperature monitoring limits using an "as-built" thermocouple location for storage of the 24PT4 DSC to be used in meeting Technical Specification (TS) 5.2.5.a. The LR also addresses addition of a 12 hour temperature monitoring criteria for storage of a 24PT1 DSC in the AHSM. The basis developed in this change is added to UFSAR Table 4.4-12, Section A.4.4.2.4 and A.8.1.1.7.

Evaluation of Change:

TS 5.2.5.a specifies temperature limits for storage of the 24PT1 and 24PT4 DSC in the AHSMs which are used to provide early indication of a blocked vent accident condition.

As noted in the TS, the temperature monitoring requirements are based on temperature measurement "at the monitored location". The specific monitored location is specified in the UFSAR text but not shown in the UFSAR drawings. Specification ANUH-01-0101, Rev. 0 was generated to document "the monitored thermocouple location" for a single thermocouple AHSM configuration as well as the "as-built thermocouple location" for the dual thermocouple AHSM configuration as specified in AHSM procurement drawings. This specification then extrapolates from these locations to the "as-built" dual thermocouple locations to define the corresponding temperature limits for the "as-built" dual thermocouple locations.

Revision 1 of Specification ANUH-01-0101 addresses the temperature limits for storage of 24PT4 DSCs in the AHSMs and adds a 12 hour temperature monitoring criteria for storage of the 24PT1 DSC in the AHSM. This provision of the 12 hour value for the 24PT1 DSC is to provide a basis should a licensee choose to use the same surveillance frequency for monitoring of the AHSMs containing 24PT1 and 24PT4 DSCs. The revised specification provides the guidance required for ensuring that the appropriate temperature limits are imposed for storage of the 24PT1 and 24PT4 DSCs, based on the as-built thermocouple location, to meet the TS requirement. As such, this specification does not represent an alteration to the Technical Specification but provides a basis for ensuring that TS 5.2.5.a is properly implemented.

The basis developed in this change is added to UFSAR Table 4.4-12, Section A.4.4.2.4 and A.8.1.1.7. There is no change to the TS requirements.

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LR 721029-202 Revision 1 – (not incorporated into UFSAR Revision 2)

Change Description:

The AHSM configuration of the Top Tie Beams (roof connection rebars) allows two options, either eight #8 rebar or five #9 rebar. This 72.48 evaluation addresses revision of the second of these options from five #9 rebar to six #9 rebar.

Evaluation of Change:

The option to use five #9 rebar was introduced by LR 721029-103 Rev. 1 and included a stress ratio result of 0.96, which was found to be in error. The new option to use six #9 rebar results in a stress ratio of 0.92. Thus, the alternate design with six #9 rebars is adequate. The roof ties are not addressed in the AHSM thermal and shielding analysis. Hence, there is no impact on the safety function of the thermal and shielding performance of the AHSM.

LR 721029-215 – (not incorporated into UFSAR Revision 2)

Change Description:

This LR addresses the addition of a Not-Important-to-Safety (NITS) tool, referred to as a "Strongback," to the UFSAR. This tool is to be used at the discretion of the licensee during installation and tack welding of the Outer Top Cover Plate (OTCP) to the DSC shell. The Strongback ensures that the OTCP is flush with or below the DSC shell lip. The only anticipated use of the Strongback is to remove bows or warps from the 24PT4-DSC OTCP caused by fabrication, or to remove any upward bowing of the Inner Top Cover Plate (ITCP) resulting from either fabrication or during ITCP closure welding.

Evaluation of Change:

There is no impact on the design function of the ITCP, OTCP or DSC shell when the Strongback is used during tack welding of the OTCP to the DSC shell. Tensioning the Strongback down will induce small temporary elastic stresses in the ITCP, OTCP and DSC shell during tightening of the Strongback bolts. In the worst case, with the OS197H lid bolts tightened to the maximum allowed load equal to 70% of yield, this will result in a compressive stress in the DSC shell of 5.1 ksi, or approximately 25% of the shell allowable. The total deflection of the OTCP, and hence the induced stress, is limited by the gap between the OTCP and the ITCP/Top Shield Plug Assembly. Once the Strongback is removed from the OTCP, the stresses in the DSC Shell and the OTCP are as reported in the UFSAR. There are no residual stress affects resulting from the use of this Strongback.

Experience gained from DSC closure welding on other projects has shown that any bowing or warping of the OTCP is typically removed by tensile stresses induced during the completion of the closure weld. There is no impact on the 24PT4-DSC weight, criticality, thermal or shielding analyses and results addressed in the UFSAR. There are no effects on the design function of the OS197H Onsite Transfer Cask.

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Non Conformances (NCRs) and Corrective Action Reports (CARs)

***LR 721029-173 Rev. 1* - (incorporated into UFSAR Revision 2)**

Change Description:

This LR addresses a revision to 24PT4 DSC shell structural calculation SCE-23.0201 Revision 2 performed to resolve quality conditions identified in TN CAR F-04.044.

Evaluation:

The quality conditions described in CAR F-04.044 have been addressed in revision 3 to the structural calculation SCE-23.0201 and have been found to have no impact on the design function of the 24PT4 shell assembly components and the associated welds. The revised weld stresses meet the specified criteria in the UFSAR and are within the limits specified by the ASME Code. The stress values for the partial penetration closure welds reported in UFSAR Section A3.6.1.1.10 and Table A.3.6-6 have been updated. There is no impact on the 24PT4 DSC thermal, shielding or confinement analysis presented in the UFSAR.

***LR 721029-203* - (no associated UFSAR change)**

Change Description:

The AHSM configuration of the Top Tie Beams (roof connection rebars) allows two options, either eight #8 rebar or six #9 rebar. This 72.48 evaluation addresses a nonconformance where certain AHSMs were fabricated with five #9 rebar.

Evaluation:

The as-built AHSM roofs, with five #9 rebar, provide a stress ratio of 0.96, as follows. The as-built tensile capacity of each tie beam with five #9 rebar is 310.5 kips. The tensile capacity of all three tie beams is 931.5 kips (310.5 kips x 3). The tensile force to be resisted by all three tie beams is 892.2 kips. Therefore, the maximum stress ratio is 0.958 (892.2/931.5). This is slightly higher than the stress ratio of 0.92 that resulted from the design change evaluated by LR 721029-202.

The as-built condition with five #9 rebar slightly exceeds the design value but is less than the maximum allowable stress ratio of 1.00. Therefore it is adequate to transmit the worst case calculated seismic forces and the as-built condition is acceptable for use.

The AHSM is not considered in the criticality analysis and is not a confinement boundary. The roof ties are not addressed in the AHSM thermal and shielding analysis; hence, there is no impact on the safety function of the thermal and shielding performance of the AHSM.

***LR 721029-207 Rev.1* - (no associated UFSAR change)**

Change Description:

TN 24PT4-DSC specification SCE-23-0112, Rev. 2, Section 5.6.1 (A) requires that all foreign materials shall be removed to produce an ASME NQA-1, Sub-part 2.1, Level D cleanliness prior to installing the basket into the shell. Contrary to the requirement of this specification, the fabricator failed to remove the ID labels attached to the BORAL™ panels installed onto the outer surfaces of the guide sleeves and covered with a thin stainless over sleeve on the first 124 guide sleeve assemblies fabricated for the 24PT4-DSC's.

This was discovered during a routine surveillance of fabrication activities when it was observed that the fabricator was not removing the plastic covered paper labels that had been placed on the BORAL™ panels by the manufacturer as a means of identifying each panel. Upon review it was determined that this condition extended to all guide sleeve assemblies fabricated to that point for both Unit 1 (24PT1-DSC) and the Units 2 and 3 guide sleeve assemblies for the 24PT4-DSC.

The Units 2 and 3 labels are approximately 1" x 2 ½", covered with a plastic overlay to protect the paper. Each label weighs ~0.3 grams for a total weight of approximately 22 grams (0.048 lbs) for a fully assembled 24PT4-DSC with 24 guide sleeve assemblies (72 labels).

Evaluation:

Structural:

Assuming that the labels are accepted for "use-as-is," and left in place on the BORAL™ panels, then there are three possible scenarios that could result once fuel is loaded into the 24PT4-DSC. These are:

- The labels do not melt/vaporize during vacuum drying (VD) operations and remain as pieces of plastic overlaying the paper present at the start of AHSM storage. The labels are then present as 72 pieces of material in an inert dry atmosphere (helium).
- The labels disintegrate during VD operations, but do not vaporize. They thus remain as solid reconfigured material sandwiched between the guide sleeves and over sleeves.
- The labels vaporize during VD operations and all that remains will be small quantities of residue.

The labels, based on a chemical analysis of the labels, are composed of mainly inert materials (cellulose) plus a small quantity of chlorides, fluorides and sulfates. The chemical composition of paper is typically 50% oxygen bound up as complex chemical compounds with carbon which may be released during vaporization of the labels. For the plastic component, which is mainly carbon and hydrogen, assuming its chemical composition is also 50% oxygen is very conservative. Therefore, a complete disintegration of the labels would result in a worst case concentration of 2.4 ppm (parts per million) which will have no impact on reflooding operations. This is a conservative assessment for a reflood condition. This small quantity of foreign material in an inert 24PT4-DSC will have no impact on the performance of the DSC or fuel cladding.

The impact of the foreign material upon DSC pressurization is assessed by conservatively assuming that the helium atmosphere is at 14.7 psia (0 psig) and all the identified chlorides, fluorides and sulfates are converted to a gaseous form results in a very conservative pressure increase of 0.13%. The maximum possible 0.13% pressure increase due to the labels when added to the calculated pressure values (UFSAR Table A.4.4-10) does not exceed the previously specified DSC design pressure values.

Related to reflood (unloading), this small amount of foreign material is too small to create a combustible gas concern. The plastic overlaid paper labels are basically complex oxygen carbon compounds that contain little in the way of hydrogenated materials and are basically inert. As such there is very little possibility of the labels contributing anything significant that would affect the allowable hydrogen limit of 2.4% described in UFSAR Chapter 8.

The impact of the foreign material on the amount of "oxidizing" gases within the DSC is also assessed. The operating procedures require two vacuum drying cycles to reduce the level of oxidizing gases below 0.25%. The two vacuum drying steps (to 3 Torr pressure, with a starting atmospheric pressure of 14.7 psia or 760 Torr) will result in a level of "oxidizing" gas (assuming air is 100% oxidizing) of 3/760 x 3/760 = 0.0016%. As described above, assuming the mass of chlorides, fluorides and sulfates plus the entire oxygen content of the labels (11 grams), results in an unexpected "oxidizing" gas contribution of 0.13%. Adding these two values, 0.0016 % (from initial VD) + 0.13% (from foreign material) = 0.1316%. This is still significantly less than the 0.25% limit assumed in the Basis for Technical Specification 1.2.2 for DSC vacuum drying.

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Based on the chemical analysis of the labels, a comparison of the published corrosion affects of these materials shows that the worst case pitting that may occur during vacuum drying would be inconsequential compared to the excess shell thickness provided in the DSC design as a corrosion allowance of 0.08 inches (0. 61" – 0.53"). The concentration of chlorides, fluorides and sulfates amounts to less than 20 ppb, which is only present during the wet phases of the fuel transfer operations and is not present during the dry storage when an inert helium atmosphere is provided.

The corrosion rate of the zircaloy clad spent fuel assemblies is conservatively assumed to be the same as that described for the DSC shell. The nominal cladding thickness is 0.0165" and full thickness corrosion would require more than 400 years. It should be noted that the DSC atmosphere is dry inert helium and the corrosion rate will be significantly lower than that defined above due to the small quantity of foreign material that could affect the helium concentration.

Based on the above discussion, the foreign material identified will have no impact on the structural analyses of the 24PT4-DSC.

Mechanical:

The Unit 1 24PT1 canisters with a similar condition have been placed in storage following successful vacuum drying, and the paper labels did not interfere with the vacuum drying process. From this experience, it is inferred that the labels will not have any adverse affect upon the 24PT4-DSC vacuum drying operations.

Thermal:

The limiting source term, and therefore the decay heat load limit for each fuel assembly and the total DSC remain unchanged. The total weight of the foreign material, (~22 grams) and reported chemical composition is insufficient to alter the DSC internal atmosphere or the previous thermal analysis presented in the UFSAR. There is no adverse impact on the calculated cladding and basket material temperatures, or material temperature limits.

Shielding:

The introduction of minute quantities of plastic and paper into the DSC does not change the source term limits as described in UFSAR Section A.5.2. The shielding analysis does not explicitly rely on the DSC internal gas environment. The volume of the foreign material is very small, contains no significant material susceptible to activation (no cobalt), and thus will not significantly alter the design basis source term used in the shielding evaluation.

Criticality:

The DSC's will be drained, vacuum dried and sealed using normal procedures. The very small amount of foreign material does not create a concern during future reflooding. As discussed above, the concentration of dissolved materials is very low, and thus the fuel cladding cannot be breached by this small amount of material, and there will be no dispersal or reconfiguration of pellet material. Thus there is no adverse impact on criticality resulting from the inclusion of the small amount of foreign material.

Weight:

There is no adverse impact. The weight of the foreign material is approximately 22 grams. This does not change the DSC Centre of Gravity location.

Confinement:

There is no impact on the confinement capabilities of the DSC's as there are no new leak paths introduced. As stated above, the foreign material does not adversely impact the stainless steel DSC pressure boundary.

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***LR 721029-209 Rev. 1* - (no associated UFSAR change)**

Change Description:

TN 24PT1-DSC specification SCE-01-0112, Rev. 2, Section 5.6.1 (A) requires that all foreign materials shall be removed to produce an ASME NQA-1, Sub-part 2.1, Level D cleanliness prior to installing the basket into the shell. Contrary to this requirement, for all the 17 24PT1-DSCs fabricated for SCE SONGS Unit 1, the fabricator failed to remove the ID labels attached to the 72 BORAL™ panels installed within each of the DSC basket.

This was discovered during the assembly of Guide Sleeves for the 24PT4-DSC (See LR 721029-207 above).

The 24PT1 DSC paper labels are approximately 1" x 2 ½" with a total weight for the 72 labels of approximately 15 grams (0.033 lbs).

Evaluation:

Structural:

Assuming that the labels are accepted for "use-as-is", and left in place on the BORAL™ panels, then there are three possible scenarios that could result once fuel is loaded into the 24PT1-DSC. These are:

- The labels do not melt/vaporize during vacuum drying (VD) operations and remain as pieces of plastic overlaying the paper present at the start of AHSM storage. The labels are then present as 72 pieces of material in an inert dry atmosphere (helium).
- The labels disintegrate during VD operations, but do not vaporize. They thus remain as solid reconfigured material sandwiched between the guide sleeves and over sleeves.
- The labels vaporize during VD operations and all that remains will be small quantities of residue.

The labels, based on a chemical analysis of the labels, are composed of mainly inert materials (cellulose) plus a small quantity of chlorides, fluorides and sulfates. The chemical composition of paper is typically 50% oxygen bound up as complex chemical compounds with carbon which may be released during vaporization of the labels. For the plastic component, which is mainly carbon and hydrogen, assuming its chemical composition is also 50% oxygen is very conservative. Therefore, a complete disintegration of the labels would result in a worst case concentration of 2.2 ppm (parts per million) which will have no impact on reflooding operations. This is a conservative assessment for a reflood condition. This small quantity of foreign material in an inert 24PT1-DSC will have no impact on the performance of the DSC or fuel cladding.

The impact of the foreign material upon DSC pressurization is assessed by conservatively assuming that the helium atmosphere is at 14.7 psia (0 psig) and all the identified chlorides, fluorides and sulfates are converted to a gaseous form results in a very conservative pressure increase of 0.09%. The maximum possible 0.09% pressure increase due to the labels when added to the calculated pressure values (UFSAR Table 4.4-11) does not exceed the previously specified DSC design pressure values.

Related to reflood (unloading), this small amount of foreign material is too small to create a combustible gas concern. The plastic overlaid paper labels are basically complex oxygen carbon compounds that contain little in the way of hydrogenated materials and are basically inert. As such there is very little possibility of the labels contributing anything significant that would affect the allowable hydrogen limit of 2.4% described in UFSAR Chapter 8.

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The impact of the foreign material on the amount of "oxidizing" gases within the DSC is also assessed. The operating procedures require two vacuum drying cycles to reduce the level of oxidizing gases below 0.25%. The two vacuum drying steps (to 3 Torr pressure, with a starting atmospheric pressure of 14.7 psia or 760 Torr) will result in a level of "oxidizing" gas (assuming air is 100% oxidizing) of 3/760 x 3/760 = 0.0016%. As described above, assuming the mass of chlorides, fluorides and sulfates plus the entire oxygen content of the labels (11 grams), results in an unexpected "oxidizing" gas contribution of 0.09%. Adding these two values, 0.0016 % (from initial VD) + 0.09% (from foreign material) = 0.0916%. This is still significantly less than the 0.25% limit assumed in the Basis for Technical Specification 1.2.2 for DSC vacuum drying.

Based on the chemical analysis of the labels, a comparison of the published corrosion affects of these materials shows that the worst case pitting that may occur during vacuum drying would be inconsequential compared to the excess shell thickness provided in the DSC design as a corrosion allowance of 0.08 inches (0. 61" – 0.53"). The concentration of chlorides, fluorides and sulfates amounts to less than 20 ppb, which is only present during the wet phases of the fuel transfer operations and is not present during the dry storage when an inert helium atmosphere is provided.

The corrosion rate of the zircaloy clad spent fuel assemblies is conservatively assumed to be the same as that described for the DSC shell. The nominal cladding thickness is 0.0165" and full thickness corrosion would require more than 400 years. It should be noted that the DSC atmosphere is dry inert helium and the corrosion rate will be significantly lower than that defined above due to the small quantity of foreign material that could affect the helium concentration.

Based on the above discussion, the foreign material identified will have no impact on the structural analyses of the 24PT1-DSC.

Mechanical:

The Unit 1 canisters have been placed in storage following successful vacuum drying, and therefore the paper labels did not interfere with the drying process.

Thermal:

The limiting source term, and therefore the decay heat load limit for each fuel assembly and the total DSC remain unchanged. The total weight of the foreign material, (~15 grams) and reported chemical composition is insufficient to alter the DSC internal atmosphere or the previous thermal analysis presented in the UFSAR. There is no adverse impact on the calculated cladding and basket material temperatures, or material temperature limits.

Shielding:

The introduction of minute quantities of plastic and paper into the DSC does not change the source term limits as described in UFSAR Section 5.2. The shielding analysis does not explicitly rely on the DSC internal gas environment. The volume of the foreign material is very small, contains no significant material susceptible to activation (no cobalt), and thus will not significantly alter the design basis source term used in the shielding evaluation.

Criticality:

The DSC's will be drained, vacuum dried and sealed using normal procedures. The very small amount of foreign material does not create a concern during future reflooding. As discussed above, the concentration of dissolved materials is very low, and thus the fuel cladding cannot be breached by this small amount of material, and there will be no dispersal or reconfiguration of pellet material. Thus there is no adverse impact on criticality resulting from the inclusion of the small amount of foreign material.

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Weight:

There is no adverse impact. The weight of the foreign material is approximately 15 grams. This does not change the DSC Centre of Gravity location.

Confinement:

There is no impact on the confinement capabilities of the DSC's as there are no new leak paths introduced. As stated above, the foreign material does not adversely impact the stainless steel DSC pressure boundary.